TECHNICAL MEMORANDUM

BRESLUBE ENTERPRISES LIMITED

BRESLAU, ONTARIO

AMBIENT AIR QUALITY SURVEY

SEPTEMBER, 1985

ARB-102-86-AQM

June, 1986

Ministry of the Environment

Ontario

Dr. David Balsillie, Director
Air Resources Branch

TECHNICAL MEMORANDUM

Breslube Enterprises Limited
Breslau, Ontario

Ambient Air Quality Survey
September, 1985

ARB-102-86-AQM

Prepared for:
The West Central Region
Ministry of the Environment

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June, 1986

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1. EXECUTIVE SUMMARY

Between September 11 and 27, 1985, Mobile Air Monitoring Unit #1 of the Air Resources Branch undertook an air quality survey in the vicinity of Breslube Enterprises Limited in Breslau, Ontario. A new vacuum distillation system had been brought on-line at this waste oil re-refinery complex and it was thought that the air quality had improved because of this installation.

Thirty-two monitoring periods comprised this survey and approximately 333 hours of common contaminant data and 31 gas chromatographic samples were acquired.

For all the measurements of the contaminants that could be directly attributed to the gaseous emissions from this re-refinery, similar concentrations or lower concentrations were measured as compared to the results reported for a survey using the identical sampling methodology carried out in October of 1984. In particular, comparable low level concentrations of total reduced sulphur compounds, carbon monoxide, oxides of nitrogen and ozone were determined whereas a definite decrease was noted for the concentrations of sulphur dioxide (in 1985, the maximum 30-minute average ground level concentration was 0.072 ppm (parts per million) whereas in 1984, it was 0.299 ppm) and average total hydrocarbon loadings as determined from the GC analyses. In 1985, the average loading was 254 ug/m^3 (micrograms per cubic meter) whereas in 1984, the average loading was 498 ug/m^3.

With respect to the concentration magnitudes of these common contaminants and the organic compounds detected downwind of this re-refinery, no exceedances of the applicable Environmental Standards, Criterion or Guidelines were recorded, although some sulphurous odours were perceived.

However, some high concentration levels of oxides of nitrogen were recorded during this survey (the Environmental Standard was exceeded during two separate monitoring periods) but the source was deemed not to be the re-refinery but vehicular traffic. These high concentrations occurred during the early morning hours and were concurrent with the arrival of plant personnel or movement of several tanker trailers in the plant area. High concentrations of carbon monoxide and near background concentrations of sulphur dioxide support this source statement.

2. INTRODUCTION

At the request of the West Central Region of the Ministry of the Environment, Mobile Air Monitoring Unit #1 (MAMU #1) of the Air Resources Branch undertook an ambient air quality survey in the vicinity of Breslube Enterprises Limited in Breslau, Ontario between September 11 and 27. The air quality in the vicinity of this waste oil re-refinery complex was thought to have improved since a new vacuum distillation system had been brought on-line. Utilizing essentially the same sampling methodology as was used during the 1984 air quality survey of this same re-refinery (ARB report #035-85-AQM), the results obtained during this period were to be compared and hopefully an improvement in air quality would be evident.

MAMU #1 contains analyzers for the continuous measurements of ground level concentrations (glc's) of a wide variety of common contaminants (such as carbon monoxide (CO), sulphur dioxide (SO_2), total reduced sulphur compounds (TRS), oxides of nitrogen (NO_x), ozone (O_3), etc.) and a complete set of meteorological parameters such as wind speed and direction, humidity, temperature, solar radiation and barometric pressure. All of these analyzers were operative during this survey and in addition, since specific hydrocarbon were also requested, gas chromatographic (GC) analyses were carried out on a number of discrete 30-minute ambient air samples. The analyses/measurements of organics (some being odourous compounds) were performed by a dual capillary column gas chromatograph (GC) prefaced by a cryogenic trace organics preconcentrator. In addition, total hydrocarbon monitoring was also accomplished by another dedicated instrument housed in MAMU #1. This being a dual flame ionization detector system capable of monitoring, on a continuous basis, total hydrocarbon concentrations along with its methane and non-methane hydrocarbon fractions. This latter instrument was used as a quantative backup for the GC sampling and analyses.

Thirty-two monitoring periods (MP's) comprised this '85 survey and approximately 333 hours of common contaminant air quality data and 31 GC samples were acquired. Eleven of the monitoring periods (sites) were at the Municipal Laboratory on Highway 17 approximately 2 km south of Breslube Enterprises (289 hours of data were acquired at this site), 16 were situated close to off plant property and downwind of Breslube Enterprises (38 hours of data and

29 GC samples), and 5 were upwind (6 hours of data and 2 GC samples). The monitoring periods, sites and source locations comprising this survey are shown on Map #1 and in Table #1.

The instrumentation of MAMU #1 is presented in Table #2.

Map #1

Breslau 1985 Ambient Air Quality Survey

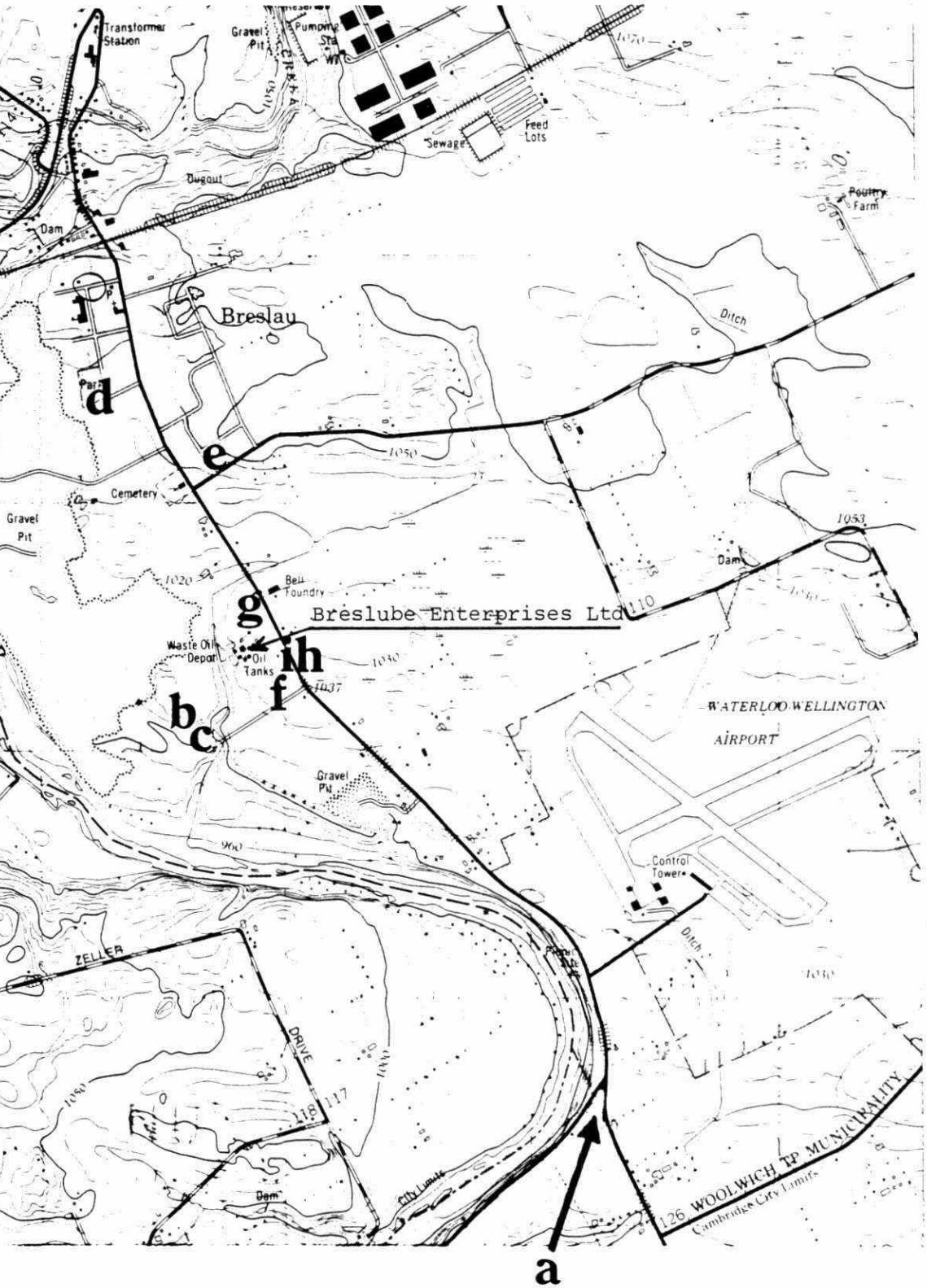


Table #1

MONITORING PERIODS '85 BRESLUBE SURVEY

PERIOD	DATE	START TIME	DURATION (HOURS)	NO. OF SAMPLES	COMMENTS	SITE ID
A112	SEP 11	1057	1.73	GC3	DOWNWIND	b
A113		1248	0.78	GC1	DOWNWIND	c
A114		1352	1.07	GC1	UPWIND	d
A115		1541	17.42		MUN. LAB OVERNIGHT	a
A122	SEP 12	1021	2.92	GC5	DOWNWIND	b
A123		1333	1.28	GC1	UPWIND	e
A124		1521	13.50		MUN. LAB OVERNIGHT	a
A131	SEP 13	523	1.88		INVERSION	b
A132		743	1.15		UPWIND	f
A133		927	73.25		MUN. LAB WEEKEND	a
A162	SEP 16	1334	16.33		MUN. LAB OVERNIGHT	a
A171	SEP 17	643	2.17	GC2	DOWNWIND	f
A172		906	1.70	GC2	DOWNWIND	d
A173		1118	1.73	GC2	DOWNWIND	g
A174		1313	1.30	GC2	DOWNWIND	h
A175		1516	17.75		MUN. LAB OVERNIGHT	a
A181	SEP 18	1220	19.92		MUN. LAB OVERNIGHT	a
A192	SEP 19	1055	3.77	GC5	DOWNWIND	h
A193		1533	14.50		MUN. LAB OVERNIGHT	a
A201	SEP 20	634	2.10	GC2	DOWNWIND	i
A202		844	1.97		DOWNWIND	i
A203		1122	70.50		MUN. LAB WEEKEND	a
A241	SEP 24	943	4.22	GC1	DOWNWIND	i
A242		1409	1.28		UPWIND	d
A243		1716	13.58		MUN. LAB OVERNIGHT	a
A251	SEP 25	621	3.55		DOWNWIND	i
A252		1159	2.35		DOWNWIND	i
A253		1429	1.13		UPWIND	d
A254		1624	15.50		MUN. LAB OVERNIGHT	a
A262	SEP 26	1034	3.62	GC1	DOWNWIND	g
A263		1516	17.17		MUN. LAB OVERNIGHT	a
A271	SEP 27	949	1.90	GC3	DOWNWIND	b
	TOTALS		333.02	GC31		

At Municipal Lab....11 Monitoring Periods and 289 Hours of Data
Downwind.....16 Monitoring Periods and 38 Hours of Data
Upwind.....5 Monitoring Periods and 6 Hours of Data

TABLE #2

THE INSTRUMENTATION OF MOBILE AIR MONITORING UNIT #1

Instrument	Manufacturer	Analytical Technique	Full Scale Sensitivity
THC, CH4, TH-M analyzer	Ingenieúr-Produktions-Gruppe Munchen (IPM) RS-t	Dual flame ionization	50 ppm THC (as CH4)
H2S,SO2,NOx sources	Hartmann & Braun Prufgasgenerator	N/A	N/A
TRS/SO2 analyzer	Monitor Labs 8850 c/w ML 8770	Fluorescence	1.0 ppm SO2 0.5 ppm TRS
NOx, NO2, NO analyzer	Monitor Labs 8840	Chemi-Luminescence	1.0 ppm NOx (as NO2)
CO analyzer	Thermo Electron P48	Gas Filter Correlation	100 ppm CO
O3 analyzer/ source	Dasibi 1003-AAS	UV Absorption	1.0 ppm O3
CO & THC sources	Matheson	Compressed Gas	N/A
Gas Chromatograph	HP 5880 Dual Capillary Column	Flame Ion-ization Det.	as set per calibrations

Meteorological Instrumentation

Instrument	Manufacturer	Scale
** Wind speed	Lambrecht GmBH	km/hr
** Wind direction	Lambrecht GmBH	degrees
Temperature	Weather Measure (WM) T621	degrees Celsius
Humidity	WM-HM-11P	absolute & %
Barometric pressure	WM-BM70-B242	millibars
Solar Radiation	WM Star Pyranometer	milliwatts/cm2

** These instruments are located on top of a 10 metre retractable tower

3. RESULTS

3.1 Monitoring at the Municipal Laboratory

As can be seen from Table #3 (data summary for the common contaminants), low and/or near background concentration levels were measured for all of the 289 hours of common contaminant data acquired at this site. For example, the overall arithmetic mean and maximum 1-hour average glc's of CO were 0.47 and 1.62 ppm respectively; of TRS, they were 0.002 and 0.003 ppm; of SO_2, they were 0.006 and 0.034 ppm; and for NO_x, they were 0.02 and 0.16 ppm.

Since low concentration levels were measured at this Lab site, this site was also considered to be an 'upwind' site for this survey. The wind/concentration frequency rose for non-methane hydrocarbons (ref. Graph #2) lends credence to this statement since it clearly shows that although one of the dominant wind directions was northeast (pointing to Breslube Enterprises), the non-methane hydrocarbon concentrations appear to be ubiquitous. Another important point noted in this graph was that for approximately 80% of the time that data was being acquired at this site, the winds were essentially calm or at speeds less than 3 km/hr. This point is also evident in the concentration/time graph (Graph #1) of the merged data set of all the data acquired at this site. As a matter of fact, the maximum 30-minute average wind speed never exceeded 15 km/hr as measured at this site.

Owing to the low non-methane hydrocarbon readings acquired at this site, no GC sampling was undertaken.

It should be mentioned that the weather during this 3-week fall period was exceptional. That is, no significant weather system pushed through this area; the days were normally bright and sunny; the winds were light to moderate (usually below 15 km/hr); and the only meteorological condition that would give rise to any significant ground level concentrations was nightime cooling or the nocturnal inversion condition. The word 'would' is used above because when the monitoring was carried out close to Breslube Enterprises Limited under this meteorological condition, unusual low concentration levels were measured for the contaminants. This was due to the fact that the plant was shut down for 4 consecutive days in the middle of this survey - i.e. from the weekend of September 15th till noon on September 19th and this fact wasn't relayed to the field staff until after the monitoring was completed. Additional early morning

monitoring was carried out after September 19th, but low concentrations were still measured (these results will be discussed in the later sub-section - Downwind).

3.2 Upwind Monitoring

As noted from the common contaminant data summary table (Table #3), essentially identical concentration levels were measured at the 5 upwind sites as compared to those reported for the Municipal Laboratory site. That is, all concentration levels were low and at or near background levels (reference concentration/time graph (Graph #3)).

Two GC samples were acquired at these upwind sites and the analyses proved them to be very clean. As can be seen from the GC summary table (Table #4), the average total hydrocarbon loading was only 58 ug/m^3 (micrograms per cubic meter) with the alkane fraction comprising approximately 23% of these loadings and the aromatic fraction 77%. The number of specific organics identified was only 16 and these accounted for 80% of the total peak area eluted on the chromatograms.

3.3 Downwind Monitoring

As noted in the common contaminant data summary table (Table #3), only the ground level concentrations (glc's) of the oxides of nitrogen (NO_x) were deemed to be significant during the monitoring carried out downwind of Breslube Enterprises. For the other common contaminants, no exceedances of the applicable Environmental Standards or Guidelines were measured - for example, the maximum 30-minute average glc's of CO was 8.53 ppm; of TRS 0.008 ppm; of SO_2 0.072 ppm; and of O_3 0.07 ppm.

For the oxides of nitrogen, the overall average glc was only 0.07 ppm whereas the maximum 30-minute average glc was 0.30 ppm - the applicable Environmental Standard is 0.025 ppm. Upon closer examination of these measurements, these elevated concentrations were recorded during the early to mid-morning periods of September 17 and 25th. The re-refinery was 'shut-down' on September 17th (see Section 3.1) and the non-methane hydrocarbon and carbon monoxide maximum 30-minute averages were 1.68 and 2.2 ppm respectively. A strong nocturnal inversion had developed overnight and there

was considerable heavy truck (vehicular) traffic in the yard during these early morning hours. The maximum concentrations of NO_x were recorded between 7:30 and 8:00 am. No sulphur dioxide was measured at this time - i.e. these concentrations were less than 0.005 ppm. Thus the most plausible source of these high NO_x concentrations was not the re-refinery but vehicular traffic. By noon, these concentrations had decreased to 0.10 ppm and the maximum 30-minute average concentrations of CO were less than 1 ppm. A very similar situation occurred on September 25th. Another strong nocturnal inversion was present but now the plant was in "full" operation. MAMU #1 was positioned near the main entrance to Breslube Enterprises on Highway #17 and data was acquired commencing at 6:21 am. MAMU #1 remained at this site for approximately 3.5 hours and during this time, two episodes of high NO_x and CO readings were recorded. The first occurred just after 7 a.m. (the maximum 30-minute average glc's of NO_x and CO being 0.28 and 8.5 ppm) and the second occurred between 8 and 8:40 a.m. (the maximum 30-minute average glc's of NO_x and CO now being 0.30 and 8.2 ppm). The maximum 30-minute average glc of SO_2 recorded at this time was only 0.01 ppm. Again the most obvious/plausible source of CO and NO_x was determined to be vehicular traffic (the arrival of plant personnel and the tanker trucks). By noon, these concentrations had decreased to the 0.08 (NO_x) and 2 ppm (CO) level. It should be mentioned that the air Quality Criterion for CO (i.e. 30 ppm) was not exceeded during this survey, thus it was deemed not to be a problem in this area (albeit some 30-minute average glc's were in excess of the Environmental Standard of 5 ppm).

As noted in Table #4, 29 GC samples were acquired downwind of Breslube Enterprises Limited. From these samples, the average total hydrocarbon loading was only 254 ug/m^3 and on the average, the alkane fraction comprised 43% (110 ug/m^3) of these loadings and the aromatic fraction 37% (94 ug/m^3). The chlorinated organics accounted for only 9% (22 ug/m^3) of these total loadings. Although the GC had the capability of identifying up to 126 different hydrocarbons, the average number of compounds identified was only 49 and the average area percent identified for all peaks eluted on the chromatograms was 63%.

From the more detailed GC summary table (Table #5), the average loadings for the common alkanes (i.e. propane, butane, 2-methylbutane, pentane and hexane) ranged from 5 to 35 ug/m^3. The more dominant aromatics were the

BTX's (i.e. benzene, toluene and xylenes) and their average loadings were approximately 20 ug/m^3. For 1,2,4-trimethybenzene, it was detected in only one GC sample and its loading was 46 ug/m^3. Thus for all organics detected in these 29 GC samples, the loadings were less than the applicable Environmental Standards, Criterion or Guidelines.

Table #3

BRESLAU '85 AMBIENT AIR SURVEY

DATA SUMMARY
FOR THE
COMMON CONTAMINANT DATA

	@ Municipal Lab	Upwind of Breslube	Downwind of Breslube
# of MP's	11	5	16

OVERALL ARITHMETIC MEAN CONCENTRATIONS

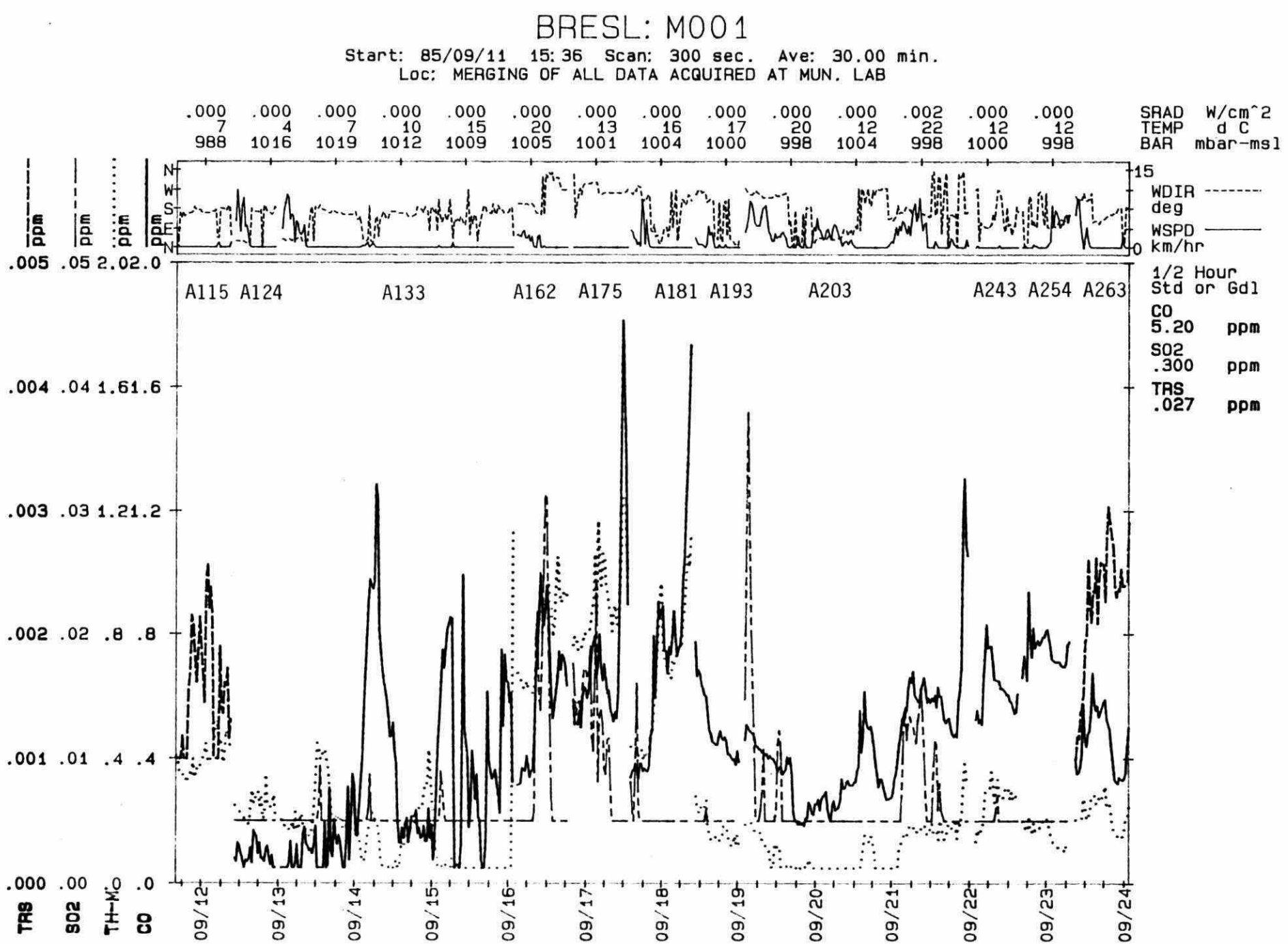
CO	0.47	0.54	1.23
TRS	0.002	0.001	0.004
SO2	0.006	0.005	0.015
THC	1.60	1.44	2.31
TH-M	0.29	0.20	0.96
NOx	0.02	0.03	0.07
O3	0.01	0.01	0.02

MAXIMUM 30-MINUTE & 1-HOUR CONCENTRATIONS

CO	(60-MIN)	1.62	(30-MIN) 1.42	(30-MIN)	8.53
TRS		0.003	0.001		0.008
SO2		0.034	0.005		0.072
THC		3.13	1.67		7.08
TH-M		1.18	0.39		5.56
NOx		0.16	0.09		0.30
O3		0.08	0.03		0.07

MAXIMUM 5-MINUTE & 1-MINUTE CONCENTRATIONS

CO	(5-MIN)	2.75	(1-MIN) 7.85	(1-MIN)	99.93
TRS		0.004	0.002		0.048
SO2		0.043	0.005		0.238
THC		10.89	2.95		13.86
TH-M		6.23	1.62		11.05
NOx		0.28	0.16		0.53
O3		0.08	0.09		0.38

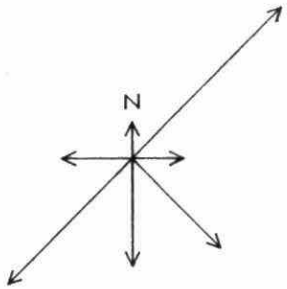

BRESL: M001
Start: 85/09/11 15:36 Scan: 300 sec. Ave: 30.00 min.
Loc: MERGING OF ALL DATA ACQUIRED AT MUN. LAB
.000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .002 .000 .000
7 4 7 10 15 20 13 16 17 20 12 22 12 12
988 1016 1019 1012 1009 1005 1001 1004 1000 998 1004 998 1000 998
SRAD W/cm^2
TEMP d C
BAR mbar-msl
WDIR
deg
WSPD
km/hr
1/2 Hour
Std or Gdl
CO
5.20 ppm
SO2
.300 ppm
TRS
.027 ppm
A115 A124 A133 A162 A175 A181 A193 A203 A243 A254 A263
TRS SO2 TH-MO CO
09/12 09/13 09/14 09/15 09/16 09/17 09/18 09/19 09/20 09/21 09/22 09/23 09/24

Graph #1

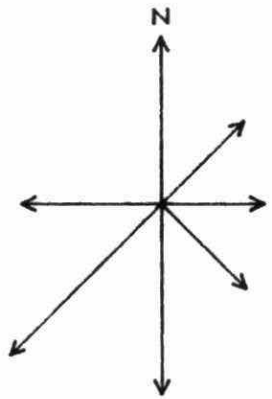
BRESL: M001

Start: 85/09/11 15:36 Scan: 300 sec. Ave: 60.0 min. Duration: 298.0 hrs.
Loc: MERGING OF ALL DATA ACQUIRED AT MUN. LAB

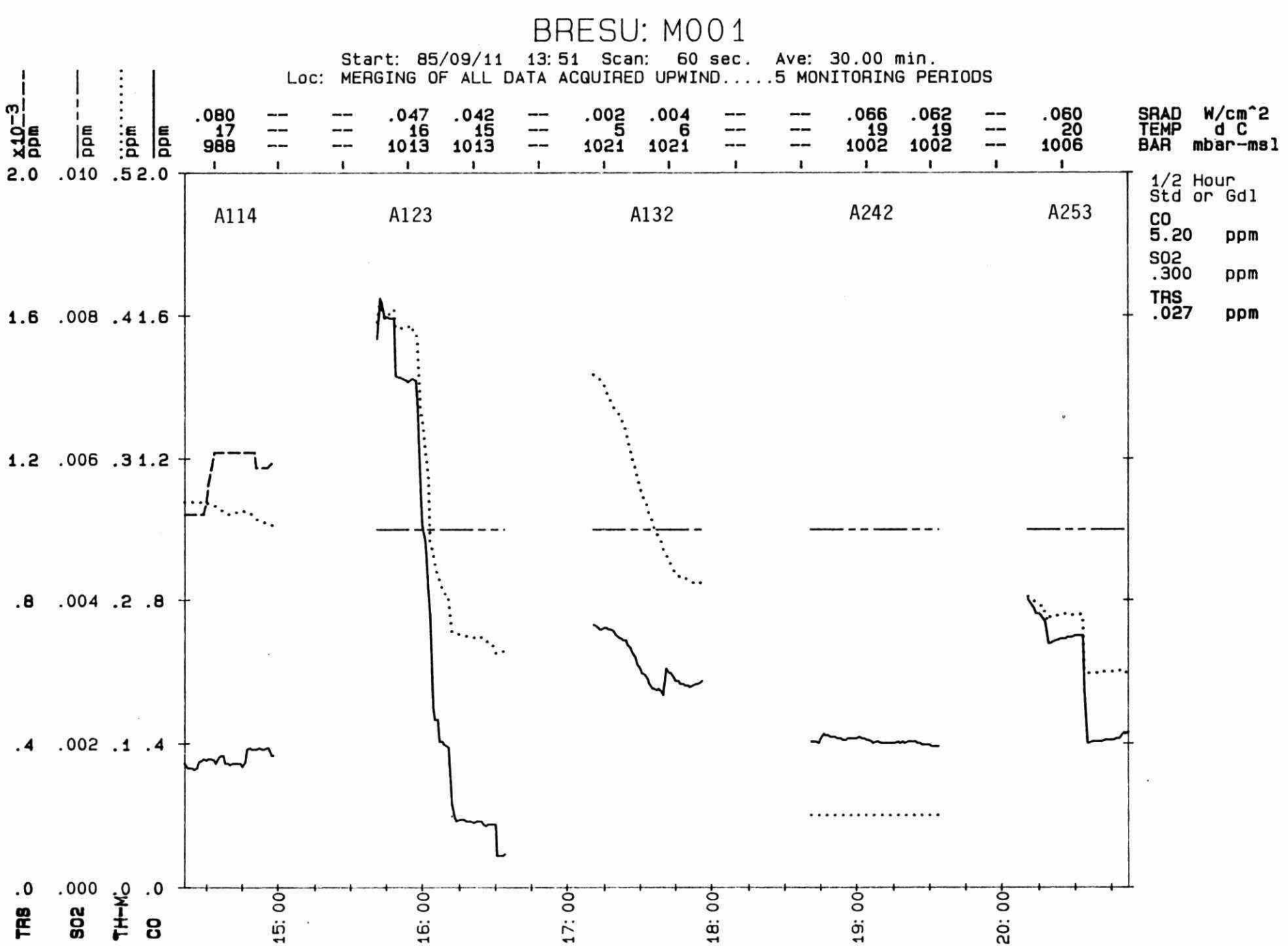
WINDS Blowing From
1 Division = 10% of Time
Calm (< 3 km/hr) = 79.5%
Low (< 3 km/hr) = .0%
High (>100 km/hr) = .0%



Non-CH4 Blowing From
1 Division = 1 ppm -- A. MEAN



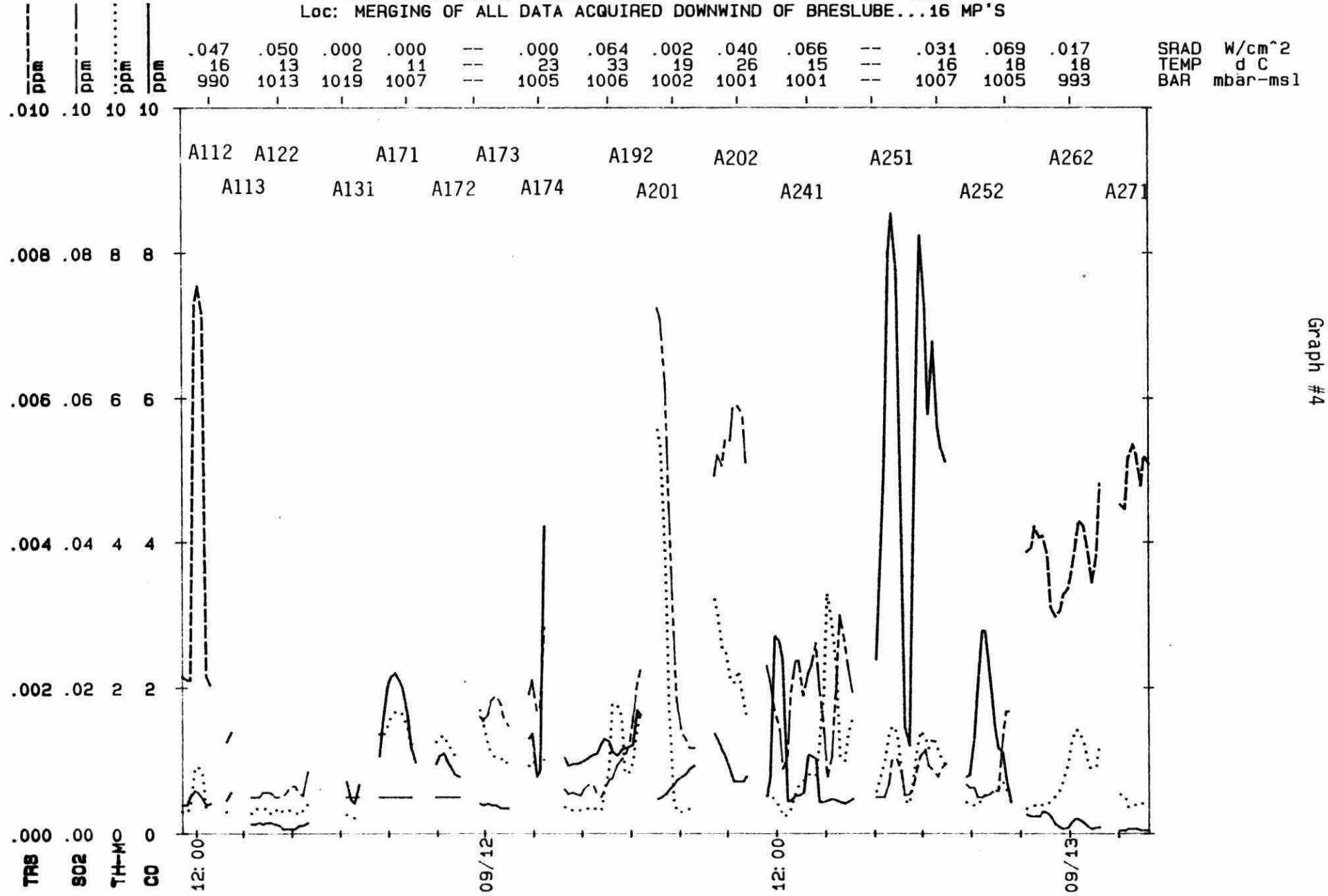
Graph #2


BRESU: M001
Start: 85/09/11 13:51 Scan: 60 sec. Ave: 30.00 min.
Loc: MERGING OF ALL DATA ACQUIRED UPWIND.....5 MONITORING PERIODS
x10^-3 ppm
ppm
ppm
ppm
.080 -- -- .047 .042 -- .002 .004 -- -- .066 .062 -- .060
17 -- -- 16 15 -- 5 6 -- -- 19 19 -- 20
988 -- -- 1013 1013 -- 1021 1021 -- -- 1002 1002 -- 1006
SRAD W/cm^2
TEMP d C
BAR mbar-msl
2.0 .010 .5 2.0
1.6 .008 .4 1.6
1.2 .006 .3 1.2
.8 .004 .2 .8
.4 .002 .1 .4
.0 .000 .0 .0
TRS
SO2
TH-HC
CO
A114
A123
A132
A242
A253
1/2 Hour
Std or Gdl
CO
5.20 ppm
SO2
.300 ppm
TRS
.027 ppm
15:00
16:00
17:00
18:00
19:00
20:00

Graph #3

BRESD: M001

Start: 85/09/11 10:56 Scan: 60 sec. Ave: 30.00 min.
Loc: MERGING OF ALL DATA ACQUIRED DOWNWIND OF BRESLUBE...16 MP'S



Graph #4

Table #4

SUMMARY OF

GAS CHROMATOGRAPHIC DATA ACQUIRED DURING BRESLAU '85 SURVEY

	DOWNWIND SAMPLES			UPWIND SAMPLES	
	AVERAGE	MAXIMUM	NUMBER OF SAMPLES	AVERAGE	NUMBER OF SAMPLES
Total Compounds Identified	49	70	29	16.00	2
Total # of Peaks	122	221	29	32.00	2
Total Area of Peaks	8130.46	24708.56	29	1956.43	2
Area of Identified Peaks	4839.26	13214.20	29	1585.58	2
Area % Identified Peaks	63	92	29	79.81	2
Total hydrocarbons ug/m3:	254.0	1362.0	29	57.79	2
Alkanes ug/m3	110.1	510.0	29	11.29	2
Cycloalkanes ug/m3	11.1	67.1	29	2.52	2
Alkenes ug/m3	16.3	91.8	29	1.72	2
Cycloalkenes ug/m3	1.3	7.4	29	0.00	2
Alkynes ug/m3	0.0	0.0	29	0.00	2
Aromatics ug/m3	93.7	685.1	29	38.71	2
Chlorinated alkanes ug/m3	12.6	61.4	29	1.37	2
Chlorinated alkenes ug/m3	3.3	21.6	29	0.00	2
Chlorinated aromatics ug/m3	5.9	38.2	29	2.24	2
Toluene:Ethylbenzene	4.9				
Benzene:Ethylbenzene	3.7				
Xylenes:Ethylbenzene	4.7				
Ethylbenzene:Ethylbenzene	1.3				

Table #5

GAS CHROMATOGRAPHIC DATA ACQUIRED DURING '85 BRESLAU SURVEY

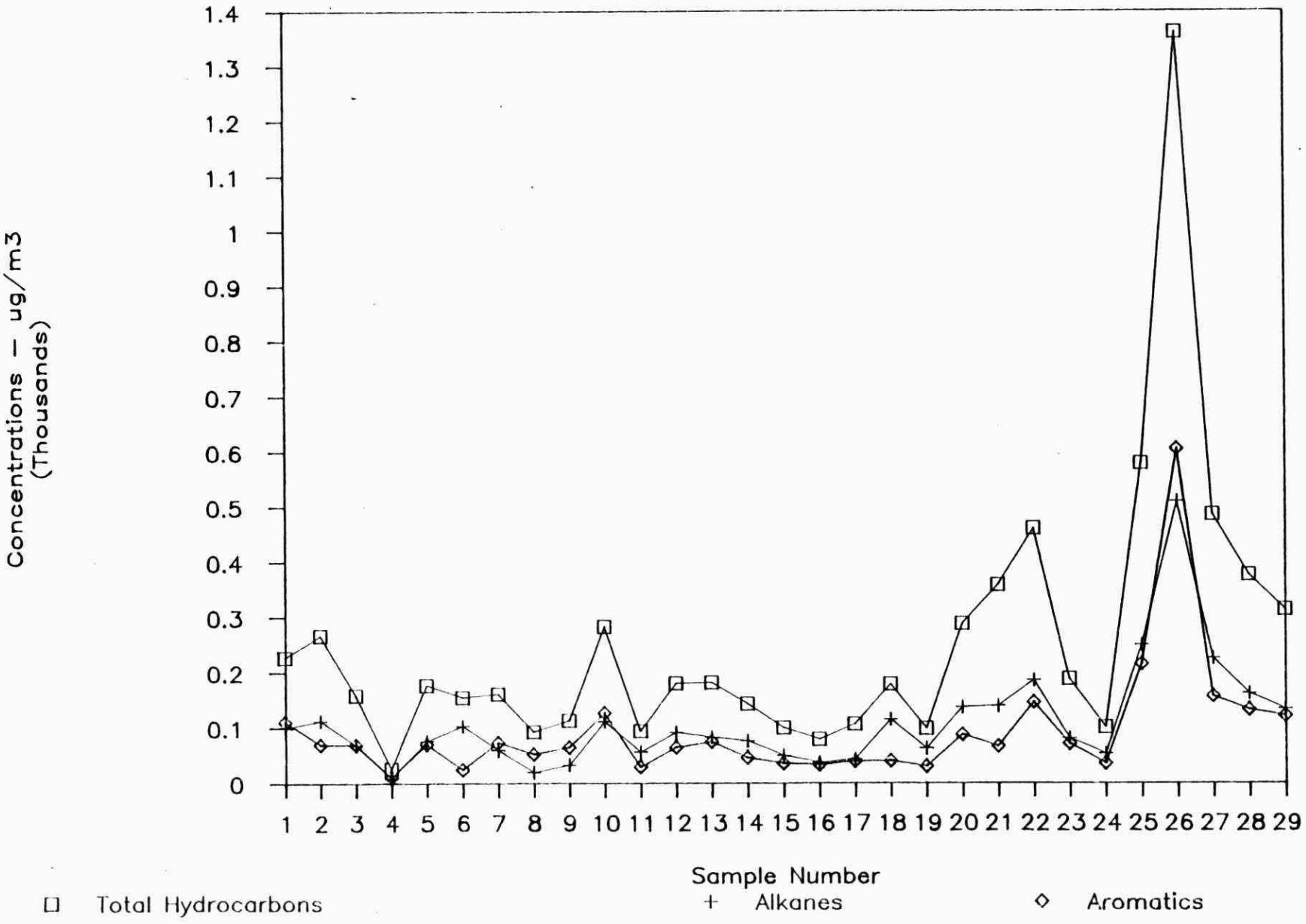
Downwind of Breslube

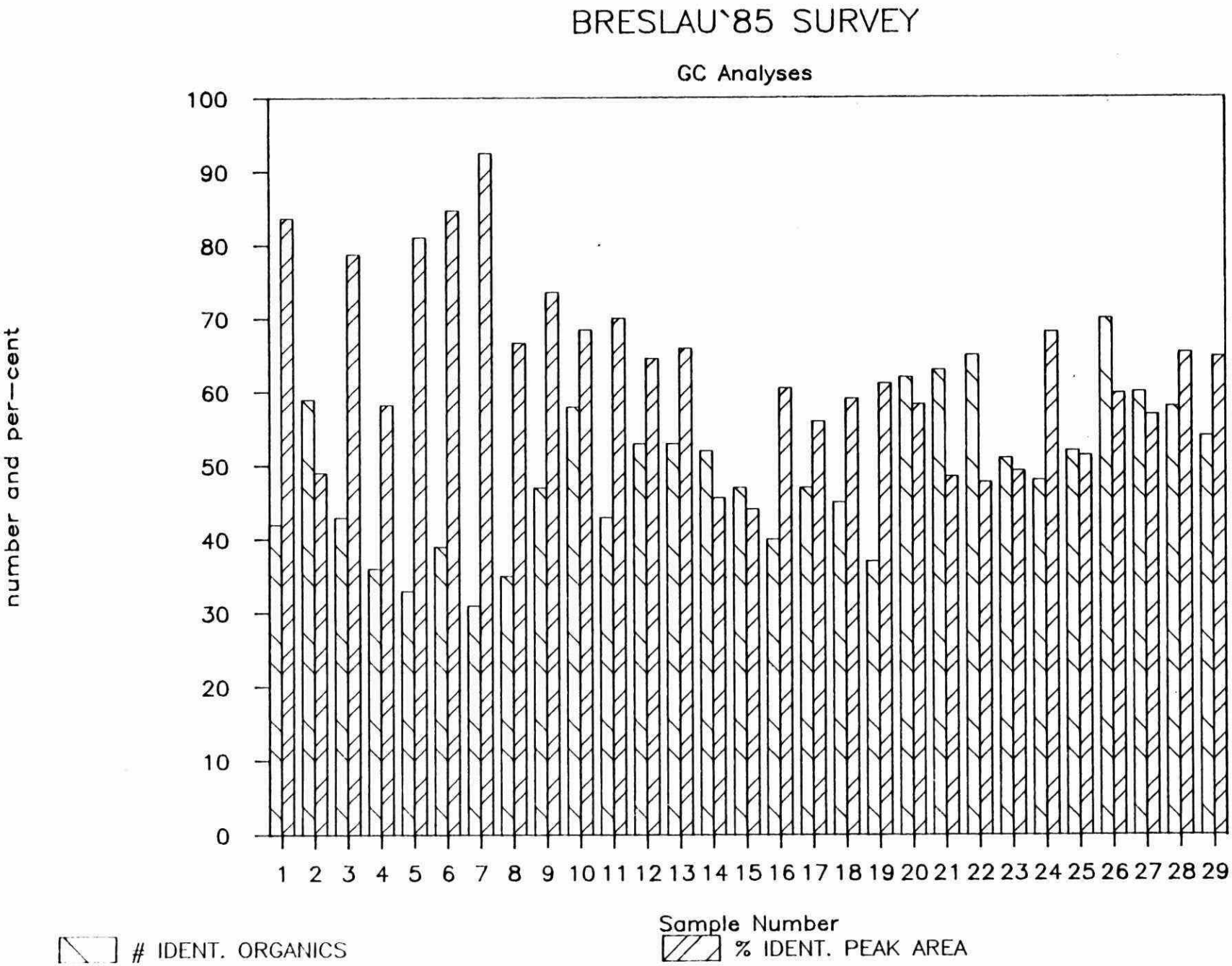
	Average	Maximum	Number of Samples
PROPANE	34.82	76.92	9
CHLOROMETHANE	0.68	0.68	1
2-METHYLPROPANE	4.69	11.98	18
1-BUTENE	4.64	7.36	4
1,3-BUTADIENE	1.23	1.61	2
BUTANE	11.86	31.10	27
3-METHYL-1-BUTENE	0.43	0.48	3
2-METHYLBUTANE	13.61	46.52	29
1-PENTENE	3.12	8.14	8
PENTANE	7.59	25.83	29
2-METHYL-1,3-BUTADIENE	1.63	3.13	8
TRANS-2-PENTENE	2.13	10.72	24
CIS-2-PENTENE	4.14	25.24	26
DICHLOROMETHANE	6.33	8.27	3
2-METHYL-2-BUTENE	4.73	29.57	25
2,2-DIMETHYLBUTANE	0.64	1.65	21
4-METHYL-1-PENTENE	0.47	0.47	1
3-METHYL-1-PENTENE	1.13	1.17	3
CYCLOPENTANE	0.98	2.18	15
2,3-DIMETHYLBUTANE	1.45	4.27	22
2-METHYLPENTANE	5.19	17.92	27
3-METHYLPENTANE	3.19	11.50	29
1-HEXENE	0.61	1.17	10
CIS-1,2-DICHLOROETHENE	1.88	1.88	1
2-CHLOROBUTANE	3.53	3.53	1
HEXANE	4.95	16.90	29
TRICHLOROMETHANE	5.44	9.52	2
TRANS-3-HEXENE	0.71	1.71	9
3-CHLORO-2-METHYLPROPENE	3.26	3.77	3
METHYLCYCLOPENTANE	2.88	8.09	27
1,1,1-TRICHLOROETHANE	4.37	9.58	3
BENZENE	14.94	87.19	29
CYCLOHEXANE	1.86	5.66	27
2-METHYLHEXANE	3.22	4.48	3
2,3-DIMETHYLPENTANE	4.38	25.99	28
CYCLOHEXENE	0.59	0.65	3
3-METHYLHEXANE	3.88	18.63	28
1,2-DICHLOROPROPANE	3.74	21.51	16
2,3-DICHLOROPROPENE	2.89	3.27	3
TRICHLOROETHENE	4.36	21.55	15
2,2,4-TRIMETHYLPENTANE	2.56	10.08	29
1-HEPTENE	0.53	0.53	1
HEPTANE	3.73	24.56	29
1-CHLORO-3-METHYLBUTANE	0.41	0.41	1
TRANS-3-HEPTENE	1.83	1.83	7

METHYLCYCLOHEXANE	3.57	30.17	29
4-METHYLCYCLOHEXENE	1.64	7.44	21
2,5-DIMETHYLHEXANE	0.73	3.60	25
1-CHLOROPENTANE	1.08	1.58	2
TOLUENE	20.19	122.02	29
1,3-DICHLOROPROPANE	3.51	4.35	2
2-METHYLHEPTANE	1.14	2.81	13
4-METHYLHEPTANE	1.60	10.41	29
3-METHYLHEPTANE	0.96	0.96	1
1-OCTENE	1.66	4.28	6
TRANS12DIMETHYLCYCLOHEXAN	1.34	4.21	14
TRANS-4-OCTENE	1.28	2.56	3
TETRACHLOROETHENE	7.40	37.23	27
OCTANE	2.38	12.67	29
2-METHYL-1-HEPTENE	1.08	3.21	9
2-OCTENE	2.52	5.56	4
CIS12DIMETHYLCYCLOHEXAN	0.90	3.85	25
CHLOROBENZENE	1.02	2.57	10
ETHYLCYCLOHEXANE	0.97	5.20	24
PROPYLCYCLOPENTANE	1.29	7.72	24
ETHYLBENZENE	4.89	30.83	27
M-XYLENE	14.29	111.12	27
4-METHYLOCTANE	0.43	0.62	2
2-METHYLOCTANE	2.69	9.83	13
STYRENE	0.77	0.77	1
O-XYLENE	4.36	33.53	29
1,1,2,2-TETRACHLOROETHANE	3.86	5.75	5
1,2,3-TRICHLOROPROPANE	4.67	14.69	6
1-NONENE	1.85	7.38	9
NONANE	4.37	39.10	23
ISOPROPYLBENZENE	0.93	3.88	9
2-CHLOROTOLUENE	2.40	12.20	26
3-CHLOROTOLUENE	6.20	6.20	1
N-PROPYLBENZENE	1.98	14.82	26
4-CHLOROTOLUENE	3.20	19.31	18
3-ETHYLTOLUENE	3.58	31.25	27
4-ETHYLTOLUENE	3.36	17.44	19
1,3,5-TRIMETHYLBENZENE	4.47	37.83	16
2-ETHYLTOLUENE	1.78	5.58	13
tert-BUTYLBENZENE	8.89	74.37	28
1,2,4-TRIMETHYLBENZENE	45.52	45.52	1
1,3-DICHLOROBENZENE	1.99	1.99	1
1,5-DICHLOROPENTANE	0.94	0.94	1
DECANE	9.53	79.98	23
1,2,3-TRIMETHYLBENZENE	3.75	11.92	16
1ISOPROPYL4METHYLBENZENE	1.20	3.23	6
1,2-DICHLOROBENZENE	4.39	9.43	7
INDAN	2.19	11.89	20
N-BUTYLCYCLOHEXANE	1.44	3.46	17
1,3-DIETHYLBENZENE	0.78	1.82	2
1,4-DIETHYLBENZENE	2.92	18.92	14
N-BUTYLBENZENE	2.86	9.22	16
UNDECANE	10.30	73.88	29
DECAHYDRONAPTHALENE	2.11	18.62	28
1235-TETRAMETHYLBENZENE	4.84	28.93	25
1234-TETRAMETHYLBENZENE	3.76	19.64	27
DODECANE	8.45	42.23	29
Total Compounds Identified	49	73	29

BRESLAU '85 SURVEY – DOWNWIND

G.C. Analyses




BRESLAU`85 SURVEY
GC Analyses
number and per-cent
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
Sample Number
IDENT. ORGANICS
% IDENT. PEAK AREA

4. CONCLUSIONS AND COMPARISONS

Lab and Upwind Measurements:

Approximately 289 hours (11 monitoring periods) of common contaminant data were acquired at the Municipal Lab and approximately 6 hours (5 monitoring periods) of common contaminant data and 2 GC samples were acquired upwind of Breslube Enterprises Limited. For all of this air quality data, low or near background concentration levels were measured. For example, the overall arithmetic mean and maximum 30-minute or 60-minute average ground level concentrations (glc's) of CO were 0.5 and 1.5 ppm respectively; for TRS, 0.002 and 0.003 ppm; for SO_2, 0.006 and 0.034 ppm; for TH-M, 0.29 and 1.18 ppm; for NO_x, 0.03 and 0.16 ppm; and for O_3, 0.01 and 0.08 ppm respectively. In 1984, the maximum 30-minute average glc's of SO_2, TRS, NO_x and O_3 as determined at the upwind and lab sites were 0.005, 0.002, 0.04 and 0.08 ppm respectively. Thus excellent agreement was obtained for the upwind and lab site measurements of the common contaminants during both of these years.

For the 2 GC samples acquired upwind of Breslube Enterprises, the average total hydrocarbon loading was only 58 ug/m^3 with the alkane fraction accounting for 19% (11 ug/m^3) of these loadings on the average and the aromatic fraction 67% (39 ug/m^3). In 1984, the upwind total hydrocarbon loadings ranged from 20 to 165 ug/m^3 and the most variable fraction was the aromatics (accounting for up to 90% of these loadings). Thus once again, good agreement was achieved between these two surveys for upwind measurements of volatile organic compounds.

Downwind Measurements:

Approximately 38 hours (16 monitoring periods) of continuously monitored common contaminant data and 29 30-minute GC samples were acquired in the vicinity of and downwind of Breslube Enterprises.

For the common contaminant data, only the ground level concentrations (glc's) of the oxides of nitrogen appeared to be a problem in this area. The Environmental Standard for NO_x (i.e. 0.25 ppm) was exceeded during two separate monitoring periods but the source was deemed not to be the re-refinery but rather the vehicular traffic in the vicinity of this complex. The meteorological conditions (namely nocturnal inversions), the time of day corresponding to shift change or arrival of a large number of tanker trucks, the corresponding increase in CO concentrations (up to 8.53 ppm for a maximum 30-minute average glc) and the absence of any significant SO_2 or TRS

concentrations support this source statement. At all other times, the glc's of NO_x were less than 0.08 ppm. In 1984, vehicular traffic was not a problem and the downwind maximum 30-minute average glc of NO_x was 0.04 ppm. In 1984, the CO glc's were in the range of 1 to 2 ppm.

For sulphur dioxide, the maximum 30-minute average glc was only 0.072. The applicable Environmental Standard is 0.30 ppm and in 1984, the reported maximum 30-minute average glc was 0.299 ppm. Thus in 1985, a significant decrease in SO_2 concentrations was noted.

Although similar glc's of total reduced sulphur compounds were measured in '85 as compared to the '84 results, higher peak values were measured in '85. The maximum 30-minute average glc determined in '85 was 0.008 ppm and the maximum 1-minute average glc was 0.048 ppm. In 1984, the maximum 30-minute and 1-minute average glc's were 0.003 and 0.018 ppm. The odour threshold for reduced sulphur compounds is approximately 0.005 ppm. Thus some reduced sulphurous odour was perceived and present but the Environmental Standard of 0.027 ppm (as set for a kraft pulp mill environment and thus used solely as a benchmark for this survey) was not exceeded.

On the average, 49 different organic compounds were positively identified and quantified in each of the 29 GC samples. The average total hydrocarbon loading was only 254 ug/m^3 but ranged up to as much as 1362 ug/m^3. (In downtown Toronto, the average total hydrocarbon loadings under inversion conditions would range up to 3 or 4,000 ug/m^3.) In 1984, the total hydrocarbon loadings ranged up to 1544 ug/m^3 and the average loadings from the 16 samples was 498 ug/m^3. Thus in 1985, a decrease of almost 50% was noted in the total hydrocarbon loadings as compared to the 1984 results. In 1985, the average alkane and aromatic fractional loadings were almost identical (110 and 94 ug/m^3 respectively). In 1984, the average alkane/aromatic fractional ratio was approximately 2:1. In 1985, the average loadings determined for the chlorinated organics was only 22 ug/m^3. In 1984, the maximum loading of chlorinated organics was 48 ug/m^3.

For the individual common alkanes, comparative loadings were obtained in 1984 and 1985 (each being below 50 ug/m^3). For the aromatics, the BTX (benzene, toluene and xylenes) average loadings were all less than 20 ug/m^3 whereas in '84, the toluene and xylenes were of this same magnitude, but

benzene was found at a loading of 175 ug/m^3 - although this latter organic compound could not be directly attributed to the emissions from this re-refinery. In 1985, the maximum loading of isobutane (2-methylpropane) was 12 ug/m^3 whereas in 1984, its maximum loading was 450 ug/m^3. In 1985, the maximum loading of 1,1,1-trichloroethane was 10 ug/m^3 whereas in 1984, its maximum loading was 300 ug/m^3. In 1985, tert.-butybenzene and 1,2,4-trimethylbenzene co-eluted on the chromatograms and since they had similar retention indicies, the specific quantification of these two organics was somewhat ambiguous. Nevertheless from the results of this survey, the maximum loadings for these two organics was determined to be less than 75 ug/m^3. In 1984, the reported loading of 1,2,4-trimethylbenzene was 240 ug/m^3.

In summary for all of these organics measured in 1985, the alkane and aromatic fractions comprised over 80% of the total hydrocarbons detected (same as in 1984) and no applicable Environmental Standard or Guideline was exceeded for any of the individual compounds. The concentrations of most organics and chlorinated organics were considerably less in 1985 than 1984.